

Short Note on Horticulture (Olericulture)

1. Production technology of turmeric

Ans: See my "*production technology of spices crop*" Note.

2. Buttoning of Cauliflower

Ans : Sometime it is observed that cauliflower plant after forming a few numbers of small leaves produced very small size curd. This condition is called buttoning of cauliflower. There is no ideal size of button card but in European countries below 9 cm sized curd is recommended as button.

Causes of buttoning

- Transplanting of aged seedling leads to buttoning. Seedling that is large and aged with thickened stem and sessile leaves are already in generative stage and buttoning occurs soon after Transplanting.
- If the growth of plant is hampered due to lack of moisture and nutrients (specially N) in the soil, then buttoning occur.
- Late planting of early variety will cause buttoning.
- Early planting of late variety will cause buttoning.
- Root injury also caused buttoning.

Remedies of buttoning

- Sometime, the colour of curd become yellow due to scorching sunlight and the curd become inferior in quality.
- The curd should be covered by leaf.
- Sometime excessive growth of pedicel and peduncle that gives a fully valvety appearance of cauliflower. Finally, it produces poor seed stalk. It causes due to lack of optimum temperature during reproduction stage.
- Sometimes, bracts grows out of the curd and the curd become inferior in quality and reduce market demand. It is causes due to high temperature.
- Sometimes, cauliflower plant produce strap like leaves and in serve cases only develop the mid rib, resulting unmarketable curd. It is causes due to deficiency of Mo.

3. Curing of Onion

- Onions should be adequately cured in the field, in open sheds, or by artificial means before or in storage. Adequate curing in the field or in open sheds may require 2 to 4 weeks, depending on the weather.
- The best skin color develops at 75 to 90° F. The most common method of curing in northern areas is by forced ventilation in the storage by blowing heated air at 75 to 85° F, through the bottom of the onion pile to the top, at two to three cubic feet of air per minute for each cubic foot of onions (or 30-50cfm/ton).

- Use the higher air-flow rate initially to remove surface moisture and seal necks. If the weather is cool and wet, forced air at 75 to 85° F and 70% relative humidity is recommended.
- If the onions are also wet, forced air at 85° F and a relative humidity of 25-35%. Relative humidity should be used as soon as storage loading is completed. This should be continued until the outer skins and neck are dry.
- Onions are considered cured when the neck is tight and the outer scales are dry and make a rustling sound when handled.
- This condition is reached when onions have lost 3 to 5 % of their weight. If not adequately cured, onions are likely to decay in storage.
- The common form of decay is gray mold rot (*Botrytis*), which occurs at the top of the bulb - hence its name "neck rot".
- High temperatures and high humidity (80%) during curing with good air circulation favor development of desirable skin color.

4. Hydroponics / Water culture

Ans : The word ‘hydroponics’ is derived from two Greek words: ‘hydro’ – meaning water, and ‘ponos’ – meaning labour.

Hydroponics is a technology for growing plants in nutrient solutions (water containing fertilizers) with or without the use of an artificial medium (sand, gravel, vermiculite, rock wool, perlite, peat moss, coir or sawdust) to provide mechanical support.

Hydroponics System in Vegetable production

Growth medium is the substitute for soil in hydroponic systems. The functions of growth medium are-

1. To provide the roots with O₂.
2. Bring the water and dissolved nutrients in contact with roots.
3. Anchor the plants so that they do not fall over.

Many different materials can be used as long as they provide the roots with O₂, water and nutrients. All the nutrients plants need are dissolved in water and they are supplied to plants every day. Macro elements (N; P; K; S; Ca) are needed in substantial amounts, whereas plants need very small amounts of micro elements (Fe; Zn; Mn; Mg; Cu; Co, Mg).

It is necessary to use was specially formulated fertilizers. Fertilizers used for hydroponics are more pure (and expensive) than other fertilizers to prevent precipitation and blockages of the system.

Different hydroponic systems- Two different hydroponic systems are used to produce vegetables: *the gravel flow* or *re-circulating system* and *the open bag* or *drain to waste system*.

1. *In the gravel flow system*, the nutrient solution is re-circulated and the roots of the plants stand in a thin film of nutrient solution all the time. Gravel or sand is used most often as growth medium.

2. ***In the drain to waste (open bag) system***, plants are grown in containers and nutrient solution is supplied to plants by means of a dripper, for up to 12 times per day. The number of irrigation cycles per day depends on temperature and the growth stage of plants. The crops in the drain to waste system grow tall and need to be trained and pruned so that they grow upwards as a single stem.

Characteristics

1. No soil is required.
2. Plants are irrigated automatically.
3. No water stress.
4. Nutrients are available at all times
5. Only soluble fertilizers are used.
6. Hydroponic fertilizer formulations contain a balanced nutrient content
7. Soil borne diseases can be eliminated
8. Hydroponic production is not organic because artificial nutrients are always used and plants are usually not grown in soil.

Advantages of hydroponic vegetable production

- Hydroponically produced vegetables can be of high quality and need little washing.
- Soil preparation and weeding is reduced or eliminated.
- It is possible to produce very high yields of vegetables on a small area because an environment optimal for plant growth is created. All the nutrients and water that the plants need, are available at all times.
- One does not need good soil to grow vegetables.
- Water is used efficiently.
- Pollution of soil with unused nutrients is greatly reduced

Disadvantages of hydroponics

- Hydroponic production is management, capital and labour intensive.
- A high level of expertise is required.
- Daily attention is necessary.
- Specially formulated, soluble nutrients must always be used.
- Pests and diseases remain a big risk.
- Finding a market can be a problem.

5. Poly-tunnel

Ans : polytunnel is most commonly an elongated semi circular shaped tunnel made out of polyethylene. They come in a wide variety of shapes and sizes.

In functionality, they fall somewhere between a garden cloche and a greenhouse, a cloche is used for the same effect with single plants while a greenhouse is much larger and often made out of glass.

Objectives

- Most importantly, a polytunnel will enable the gardener to grow fruit and vegetable plants.
- Temperatures, humidity, irrigation and ventilation can all be easily controlled via the wide range of polytunnel equipment commonly available.
- Polytunnels work out much cheaper to buy, maintain and install than greenhouses and are quite easy to put up and manoeuvre yourself.
- The polyethylene or polythene film most commonly used biodegrades naturally over a long period. It will generally last between 3 to 10 years depending on usage and site etc, before needing replacement.

Importance

- The polytunnels main use is to create a sort of microclimate that provides higher temperatures and humidity allowing you to grow various fruit and vegetable plants even when they are out of season.
- They are also an excellent form of crop protection, protecting plants from heat, cold, wind, rain and strong sunlight.
- Another major benefit of having a polytunnel is that they are not a permanent structure and can be moved about or taken down completely, quite easily.
- Smaller polytunnels or hobby tunnels can be used as a kitchen garden for herbs and salads, and larger ones can be used for anything, from growing entire vegetable crops to plant and flower nurseries.

Principles of preparation a Polytunnels

- Flat, even ground.
- Access to a decent water supply.
- A nice sunny area with some shade (next to a wall or hedge).
- Try and position it N/S instead of E/W to minimize the amount of direct heat from the sun.

Basically all kinds of flowers, fruit and vegetable plants can be grown. 80% of all soft fruits on the market can be grown in polytunnels. Here is a list of plants commonly grown in a polytunnel: tomatoes, strawberries, potatoes, cucumbers, peppers, salad greens, radish, carrots, melons, cauliflower, lettuce, chillis, peas & beans, cabbage, oriental salads, onions.

6. Processing of White pepper

Ans : See "*Processing of some spices crops*" note.

7. Pruning of Tomato

Ans : Pruning means pinching off the shoots or "suckers" that sprout from the stem in the crotch right above a leaf branch.

- Pruning a tomato plant can help promote fruit growth and better air circulation.
- Always prune on a sunny day with a good forecast.

Steps of Pruning

Locate the suckers for removal- Suckers left to grow will take energy from the rest of the plant and cause the plant to bear fewer fruits. This isn't always a bad thing, but strategically removing suckers will help the plant bear large fruit all season long.

Remove all suckers and their leaves below the first flower cluster- This keeps the plant strong by helping it grow a sturdy central stem. To remove a sucker, grab a growing tip by the base between the thumb and forefinger and bend it back and forth until it snaps cleanly. This should ideally be done when the shoot is young and supple. The small wound will heal quickly. This is called "simple pruning". As for stems and leaves, not the suckers, growing below the first flower cluster.

Leave the thicker shoots- Thicker suckers should not be snapped off, since this could damage the whole plant. If it's thicker than a pencil, use the "Missouri pruning" method and pinch out just the tip of the sucker, leaving one or two leaves behind for photosynthesis and to protect developing fruit from sun scald. This method also leaves a few inches on the sucker to reduce the shock to the plant. Prune suckers all summer long to keep the plant healthy. They grow quickly, so may need to prune once or twice a week.

Remove yellow leaves- Yellow leaves are leaves that use up more sugar than they produce. As the plant begins to mature, the lower leaves will naturally begin to yellow and wilt. This is perfectly normal, so pull these from the plant when they appear. It will keep the plant fresh and help ward off disease.

Pruning Roots- Root pruning is a special trick that can use to speed up the ripening of early tomatoes. By cutting the roots, put quite a bit of stress on the plant, which causes it to mature more quickly. To root-prune trench-planted tomatoes, take a long kitchen knife and make a cut down along just one side of the buried main stem, 1 to 2 inches away from it, going down 8 to 10 inches. If the tomatoes are planted vertically, cut halfway around the plant, 1 or 2 inches from the stem and 8 to 10 inches deep. If a knife doesn't work well, try a spade or a shovel.

Top the plant- To get the best out of the last growth of the season, it is necessary to "top" the plant. About a month before the first expected frost, remove the plant's terminal shoot. At this point in the season, the tomatoes currently growing will have a limited time to reach maturity, so all nutrients must be directed straight to the fruit.

8. Vegetable Seed Storage

Ans : Container used for storage-

- Metallic container
- Thick polythene bag
- Glass container: Boium, bottle
- Earthen container

The container used for seed storage purpose should be airtight. The opening should be sealed well so that air and humidity can not enter into container. Besides, during storage the moisture percentage should be minimum.

For short time of storage: Gunny bag or bags of cloth can be used for storage of seeds upto some weeks.

When seeds are stored in sealed container in low temperature, the container should be airtight. In case of cold storage, seeds should be kept in airtight container because normal storage house have high relative humidity (85%) which may increase the moisture percent of seeds. If seeds are not stored in sealed container, then it will absorb water.

Ideal place for dry seed storage- The ideal place for dry seed storage is de-humidified cold storage, which have low relative humidity and low temperature. Here, Normally temperature is 10⁰ C and RH is 50%.

Advantage-

- Seed can be stored for a period of 3-8 years depending on species.
- Seed can be stored by packing in gunny bag and cloth bag.
- Huge amount of seeds can be stored.
- To little amount of seeds (breeder seeds), we can use desiccator which have RH control system.

The main reason of deteriorating seed quality during storage period-

- *Initial seed condition-* Low nutrient content in seeds, injured of mature or immature seeds during harvesting.
- *Storage condition-* Humidity, temperature and other condition.

9. Crop Rotation

Ans : Crop rotation is a process of growing different crop in regular recurrent succession on a piece of land for specific period of time.

Advantage / Importance

There are many Importance both direct and indirect. This are-

1. Maintain soil fertility and productivity.
2. Ensure Economic use of soil resources.
3. Improve soil physical and biological condition.
4. Provide better weeds and insect control.
5. Prevent soil erosion.
6. Economize farm, labour and cost.

7. Provide economic utilization of manure and fertilizer.
8. Systematized the family business.
9. Crop diversification is possible.
10. Ultimately increase the crop yield.

Disadvantage / Limitations

1. Rotation are not always advisable.
2. In case of producing silage, such as maize or sorghum which are very heavy and bulky, it may be advisable to grow this crops on the field near silo pit.
3. Weather condition an other accidents may interfere the rotation.
4. Soil type may be suited for only 1 or 2 crops.
5. Soil topography restricted to grow more than one crop in particular locality.

Planning / Principles of Crop rotation

1. Local demand for the crop is the prime consideration.
2. It should have flexibility to introduce alternate crops under adverse condition.
3. It should include a food crop for consumption by the farmers and a fodder crop for livestock.
4. Smother or cover crop should be included in rotation to control soil erosion.
5. Good rotation should include green manuring crops.
6. Good rotation should include leguminous crop.
7. Good rotation should include profitable cash crop.
8. Good rotation should include one tilled crop for eliminating weeds.
9. Good rotation should include heavily manured crop to increase nutrient status in soil.
10. Deep rooted crop should be followed by shallow rooted crops.
11. Adjustment of the crop should be made according to irrigation facilities.
12. During rotation the land should be kept fallow for one season.
13. Grain crops should be followed by leguminous crops.
14. The rotation and feeding system should provide for keeping up the organic matter of the soil.

10. Role of Water in Vegetable Production

1. Water is an essential component of protoplasm.
2. Necessary photons (H^+) are obtained from water. This H^+ ion are necessary for reduction of CO_2 in photosynthesis.
3. Water is very important for cell enlargement and cell division.
4. Water is required to carbohydrate synthesis.
5. Protein synthesis occur due to water.
6. Water is well solvent of different materials of a plant body as well as it helps to transportation organic materials from one plant to another plant.
7. Water required for pollen viability, receptivity of stigma and completion of fertilization.
8. Water is need during germination.
9. After germination, water is required @ 90% of field capacity.
10. Turgor pressure in plant body is maintained by water.
11. Opening of stomata (CO_2 intake) depend on the amount of water in plant body, particularly in the vacuole of parenchyma cell adjacent to stomata.
12. Water keeps to plant cool.
13. Intake and exhaustion of gases (CO_2 & O_2) in a cell are accelerated by a thin layer of water surrounding the cell.
14. Before Transplanting, water should be 60-70% of the field capacity.
15. After transplantation, it should be 70% at the field capacity.
16. During vegetative growth, flowers initiation water is needed 50-80% of the field capacity.
17. During seed maturation, 60% and for vegetables before few days of harvesting water should be 30-40% at the field capacity.
18. During photosynthesis, the plant exposes only 1/100 to 1/1000 parts of absorbed water.
19. Overall growth and development of a plant is hampered in the water stress condition.

11. Planting time of Coriander, Onion, garlic, chili and aniseed

Coriander : October - November.

Onion : Sowing time: September - October.

Transplanting time : October - November.

Garlic : Mid October - mid November.

Aniseed :

12. Genera of Araceae Family

The family contains over 3700 species into approximately a 100 genera. Some genera are given below with example-

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| 1. Gymnostachys : <i>Gymnostachys anceps</i> | 16. Anadendrum : <i>A. affine</i> |
| 2. Lysichiton : <i>Lysichiton americanus</i> | 17. Epipremnum : <i>E. pinnatum</i> |
| 3. Orontium : <i>Orontium aquaticum</i> | 18. Heteropsis : <i>H. salicifolia</i> |
| 4. Symplocarpus : <i>S. foetidus</i> | 19. Holochlamys : <i>H. beccarii</i> |
| 5. Spirodela : <i>S. punctata</i> | 20. Monstera : <i>M. deliciosa</i> |
| 6. Lemna : <i>L. minor</i> | 21. Rhaphidophora : <i>R. celatocaulis</i> |
| 7. Spirodela : <i>S. polyrrhiza</i> | 22. Rhodospatha : <i>R. latifolia</i> |
| 8. Wolffia : <i>W. angusta</i> | 23. Scindapsus : <i>S. alpinus</i> |
| 9. Wolffiella : <i>W. gladiata</i> | 24. Spathiphyllum : <i>S. cochlearispathum</i> |
| 10. Anthurium : <i>A. scherzerianum</i> | 25. Stenospermation : <i>S. flavescens</i> |
| 11. Pedicellarum : <i>A. paiei</i> | 26. Anaphylloopsis : <i>A. americanum</i> |
| 12. Pothoidium : <i>P. lobbianum</i> | 27. Anaphyllum : <i>A. wightii</i> |
| 13. Pothos : <i>P. repens</i> | 28. Cyrtosperma : <i>C. johnstonii</i> |
| 14. Alloschemone : <i>A. inopinata</i> | 29. Dracontioides : <i>D. desciscens</i> |
| 15. Amydrium : <i>A. medium</i> | 30. Dracontium : <i>D. spruceanum</i> |

13. Curing of Potato

Ans : Curing is a process that will further toughen up the skin of the tubers. Place the potatoes where there are moderate temperatures but high humidity for ten days. Before storage, potatoes should be culled and cured. Cull and discard any damaged, diseased or frozen tubers. Curing potatoes heals the skin, making it less susceptible to damage and disease. Potato curing process are given below-

1. In late summer when the potato foliage has died back, potatoes can be dug and “cured” for storage. Curing toughens up a potato’s skin and extends its storage life.
2. Cure potatoes by exposing them to temperatures between 50 and 60 degrees F and 95% relative humidity for 10 to 14 days.

3. Cure the tubers by laying them out on newspaper in a well-ventilated place that's cool (50 to 60 degrees F.) and dark (so they don't turn green).
4. After about two weeks, the skins will have toughened up. Rub off any large clumps of dirt (potatoes should never be washed before storage) and cull any damaged tubers, which should be eaten, not stored.
5. Treat the tubers very gently so as not to bruise or cut them. Nestle your spuds into ventilated bins, bushel baskets, a Root Storage Bin or a cardboard box with perforated sides.
6. Completely cover the boxes or baskets with newspaper or cardboard to eliminate any light. Even a little light will cause potatoes to turn green and be rendered inedible.

14. Cole Crops and it's Flowering Characteristics

Ans : "Cole" refers to any of various plants belonging to the Cruciferae or mustard family.

This group of crops belongs to the family Cruciferae, and is thus also referred to as cruciferous crops or crucifers. The commercially important crops all belong to the genus *Brassica*, hence the reference to brassica crops or simply brassicas.

The botanical names of these crops, are:

- Cabbage - *Brassica oleracea* L. var. *capitata*.
- Cauliflower - *B. oleracea* L. var. *botrytis*
- Sprouting broccoli (or calabrese) - *B. oleracea* L. var. *italica*.
- Brussels sprouts - *B. oleracea* L. var. *gemmifera*.

Some other vegetables in the same family include chinese cabbage, choumoellier, horseradish, kohlrabi, kale, various mustards, radish, turnip, swede (or rutabago), as well as a number of lesser-known vegetables.

Flowering characteristics of Cole crops

1. The flowers form ebracteate, racemose. flowers are borne in terminal racemes which develop on the main stem and all its branches.
2. The bright yellow hypogynous flowers borne on slender pedicels are perfect, regular.
3. The flower have 4-free saccate sepals, 4- free clawed petals, 6-stigma with a 2-celled ovary containing many ovules per cell.
4. The ovary is superior.
5. They can be disymmetric or slightly zygomorphic, with a typical cross-like arrangement.
6. Cole crops generally cross-pollinated crop. Pollination occurs by entomogamy; nectar is produced at the base of the stamens and stored on the sepals.
7. The pistil is made up of two fused carpels and the style is very short, with two lobes.

8. The inflorescence is dwarfed and umbrella-shaped and often apically corymb-like.
9. The stored nutrients are used to produce a flower spike 1 to 2 metres (3–7 ft) tall bearing numerous yellow flowers.

15. Organic Farming

Ans : See "*Organic Vegetable farming*" Note.

16. Processing of Ginger

Ans : See "*Processing of some spices crop*" Note.

17. Processing of Black Pepper

Ans : See "*Processing of some spices crop*" Note.

18. Fruit Setting of Bottle gourd

Ans : Fruit set in cucurbit are very much influenced by environmental factors. Usually fruit set takes place, in early morning.

Majority of cucurbit flowering 30-45 days after sowing and follows a definite sequence. An alternate sequence of male and female flower fallow upto fruit set.

In bottle gourd later in the day and set fruit at higher temperature of midday. slightly wet to semi dry ecological condition is suitable for this crop. Night and day temperature 18-22⁰ C and 30-35⁰ C is optimum for its fruit set. In bottle gourd, both staminate and pistillate flowers open between 4.30 and 6.00 pm.

Natural pollination supplemented with hand pollination is the most successful for fruit set. Fruit set can be increased by spraying twice at 2 or 4 leaf stage with maleic hydrazide (400 ppm), boron (3 ppm), calcium (20 ppm) etc.

Flowering and Fruit Set

In the main summer season crop flowering starts at about 40 days after sowing. Generally male flowers appear first at about 10th node and female flowers follow the sequence and appear at 8th to 15th node. Thereafter the flush of male and female flowers continue to occur in the plants for next 50-80 days till the latter decay and die. The ratio of male:female flower may vary from 5:1 to 15:1 in the common types. Sex ratios are highly sensitive to environment and nitrogen application. Long days, high temperature, and high nitrogen rates promote greater number of male flowers. In cool weather, numerous female flowers may be borne in bottlegourd plants (Figure 6) than male flowers, but all the female flowers do not turn into fruits. In general, higher proportions of female flowers are borne in a plant even during summer but only a few turns into fruits. First green edible fruits are available in 55-65 days after sowing in early varieties.

19. Vine Lifting of Sweet Potato

Ans : It is a special type of intercultural operation. Sweet potato are usually grown from vine cutting or stem cutting. 2-3 weeks after sowing the vines come in contact to the soil surface adventitious root system come from every node. As result roots are formed as carbohydrate produced in the plant. Then the vine lifting is done.

The main purpose of vine lifting is to prevent water and nutrients supplied to these roots from developing in the nodes of the expanding vines which come in contact with the soil. Small, irregular roots may develop if nodes from vines come in contact with the soil surface, draining carbohydrates from the normal roots destined for market. Vines should not be turned over because this may cause rotting of the leaves in contact with the soil.

2-3 vine liftings may be necessary several days after irrigation when vine growth is vigorous, especially on moist, fertile soils.

In practice, the benefit of vine lifting varies with the cultivar and weather conditions. It is very necessary to increase the yield of sweet potato.

20. Flavouring Substances

- **Coriander** : Coriandrol.
- **Clove** : Diallyl disulfide and Diallyl trisulfide.
- **Cinnamon** : Cinnamic aldehyde and eugenol.
- **Aniseed** : Anethole.
- **Cardamon** : Limonene, Cineole, Borneol etc.

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